AMENDMENT TO THE CLAIMS

1. (Currently Amended) An apparatus for use in an industrial process control or monitoring system, comprising:

a process device for coupling to an industrial process which includes a process transmitter or controller to monitor or control the industrial process and communicate ~~over a two-wire process control loop~~;

a process coupling configured to couple the process device to a process which includes piping carrying a process fluid;

a vibration sensor configured to sense vibrations and provide a sensed vibration signal; and

diagnostic circuitry located in the process device configured to receive the sensed vibration signal and responsively provide a diagnostic output related to a process disturbance or operation of a process component.

2. (Original) The apparatus of claim 1 wherein the process device includes a process variable sensor for sensing a process variable.

3. (Original) The apparatus of claim 1 wherein the process device includes a control element configured to control operation of the process.

4. (Original) The apparatus of claim 1 wherein the process device includes an input configured to receive a process signal.

5. (Currently Amended) The apparatus of claim 1 wherein the process device includes output circuitry including communication circuitry configured to couple to ~~the~~a two-wire process control loop.

6. (Original) The apparatus of claim 1 wherein the vibrations are carried through process components.

7. (Original) The apparatus of claim 1 wherein the vibration sensor comprises an accelerometer.

8. (Original) The apparatus of claim 1 wherein the vibration sensor is configured to sense vibrations along one axis.

9. (Original) The apparatus of claim 1 wherein the vibration sensor is configured to sense vibrations along more than one axis.

10. (Original) The apparatus of claim 1 wherein the output from the diagnostic circuitry is transmitted on a process control loop.

11. (Original) The apparatus of claim 1 wherein the diagnostic output is related to failure of a process component.

12. (Original) The apparatus of claim 1 wherein the diagnostic output is related to degradation in performance of a process component.

13. (Original) The apparatus of claim 1 wherein the diagnostic output is related to an impending failure of a process component.

14. (Original) The apparatus of claim 1 wherein the diagnostic output is based upon a comparison of sensed vibrations to a base line level.

15. (Previously Presented) The apparatus of claim 14 wherein the base line level is determined based upon history of the process.

16. (Original) The apparatus of claim 1 wherein the diagnostic output is based upon an accumulation of sensed vibrations.

17. (Previously Presented) The apparatus of claim 16 wherein the diagnostic output is based upon a comparison of accumulated vibrations to a threshold.

18. (Original) The apparatus of claim 1 wherein the diagnostic output is based upon trends in the sensed vibrations.

19. (Original) The apparatus of claim 1 wherein the diagnostic output is used to adjust a control algorithm.

20. (Original) The apparatus of claim 1 wherein the diagnostic output is used to compensate a process variable measurement.

21. (Original) The apparatus of claim 1 wherein the diagnostic output is based upon a frequency spectrum of the sensed vibrations.

22. (Original) The apparatus of claim 1 wherein the diagnostic output is based upon rules.

23. (Original) The apparatus of claim 1 wherein the diagnostic circuitry implements a neural network.

24. (Original) The apparatus of claim 1 wherein the diagnostic circuitry implements fuzzy logic.

25. (Original) The apparatus of claim 1 wherein the diagnostic output is based upon sensed spikes in the vibration signal.

26. (Original) The apparatus of claim 1 wherein the diagnostic output is based upon a rolling average of the vibration signal.

27. (Original) The apparatus of claim 1 wherein the vibration sensor is selected from a group of vibration sensors including of capacitive, electrodynamic, piezoelectric and Micro-Electro-Mechanical Systems (MEMS).

28. (Original) The apparatus of claim 1 wherein the diagnostic output is correlated with process operation.

29. (Original) The apparatus of claim 1 including a plurality of process devices configured to sense vibrations.

30. (Original) The apparatus of claim 1 wherein the process device is completely powered from a process control loop.

31. (Original) The apparatus of claim 1 wherein the process device is configured to couple to a process control loop selected from the group of process control loops consisting of two, three and four wire process control loops.

32. (Currently Amended) A method of monitoring operation of an industrial process control system, comprising:

physically coupling a process device to an industrial process which carries a process fluid in process piping and which includes process transmitters or controllers to monitor or control the industrial process which communicate ~~over a two-wire process control loop~~;

sensing process vibrations with a vibration sensor in the process device, the vibrations received through the physical coupling; and

diagnosing operation of a process component or a process disturbance based upon the sensed vibrations.

33. (Original) The method of claim 32 including sensing a process variable.

34. (Original) The method of claim 32 including controlling operation of the process.

35. (Currently Amended) The method of claim 32 including outputting data on ~~the~~a two-wire process control loop.

36. (Original) The method of claim 32 wherein the process vibrations are carried through process components.

37. (Original) The method of claim 32 wherein sensing vibrations comprises sensing vibrations along one axis.

38. (Original) The method of claim 32 wherein sensing vibrations comprises sensing vibrations along more than one axis.

39. (Original) The method of claim 32 wherein the diagnosing is related to failure of a process component.

40. (Original) The method of claim 32 wherein the diagnosing is related to an impending failure of a process component.

41. (Original) The method of claim 32 wherein the diagnosing is based upon a comparing of sensed vibrations to a base line level.

42. (Original) The method of claim 41 wherein the base line level is determined based upon history of the process.

43. (Original) The method of claim 32 wherein the diagnosing is based upon an accumulation of sensed vibrations.

44. (Original) The method of claim 43 wherein the diagnosing is based upon a comparison of accumulated vibrations to a threshold.

45. (Original) The method of claim 32 wherein the diagnosing is based upon trends in the sensed vibrations.

46. (Original) The method of claim 32 including adjusting a control algorithm based upon the diagnosis.

47. (Original) The method of claim 32 including compensating a process variable measurement based upon the diagnosing.

48. (Original) The method of claim 32 wherein the diagnosing is based upon a frequency spectrum of the sensed vibrations.

49. (Original) The method of claim 32 wherein the diagnosing is based upon rules.

50. (Original) The method of claim 32 wherein the diagnosing is implemented in a neural network.

51. (Original) The method of claim 32 wherein the diagnosing is implemented in fuzzy logic.

52. (Original) The method of claim 32 wherein the diagnostic output is based upon sensed spikes in the vibration signal.

53. (Original) The method of claim 32 wherein the diagnosing is based upon a rolling average of the vibration signal.

54. (Original) The method of claim 32 including correlating the diagnosing with process operation.

55. (Original) The apparatus of claim 1 wherein the vibration sensor senses vibration in the process received through the process coupling, a mounting arrangement or a wiring system.